# Claims

[c1]    What is claimed is:

1. A method of optimizing idle speed for a fuel injected engine comprising the steps of:

determining instantaneous current requirements of electronics of a watercraft;

from the instantaneous current requirements, determining a minimum engine speed necessary to drive a battery charging device of the watercraft; and

adjusting, on-the-fly, idle speed of the fuel injected engine to the minimum engine speed.

[c2]    2. The method of claim 1 wherein the step of determining instantaneous current requirements of electronics of the watercraft at idle further includes the step of acquiring current feedback data from a plurality of current sensors operationally connected to the electronics.

[c3]    3. The method of claim 1 further comprising the step of determining a charge level of a battery of the watercraft.

[c4]    4. The method of claim 3 wherein the step of determining a minimum engine speed includes the step of isolating an engine speed sufficient to drive the battery charg-

ing device to charge the battery given the instantaneous current requirements of the electronics and the battery charge level.

[c5]     5. The method of claim 4 further comprising the step of comparing the instantaneous current requirements of the electronics and charging output of the battery charging device with a predetermined map of data to determine the minimum engine speed.

[c6]     6. The method of claim 1 further comprising the step of adjusting the idle speed to a level sufficient to drive the battery charging device such that a charge level of a battery of the watercraft remains above a predetermined charge level.

[c7]     7. The method of claim 1 wherein the electronics include at least one of an ECU, lights, live well aerators, pumps, fuel injectors, and alternator.

[c8]     8. An outboard motor comprising:
an internal combustion engine;
an alternator driven by the engine and connected to charge a battery;
an idle speed controller connected to the engine and configured to adaptively set an idle speed of the engine; and

an ECU to instruct the idle speed controller to set an idle speed of the engine based on instantaneous power requirements on the battery.

[c9] 9. The outboard motor of claim 8 further comprising a plurality of current sensors connected to provide feedback to the ECU of instantaneous current requirements of a plurality of auxiliary devices.

[c10] 10. The outboard motor of claim 8 wherein the ECU further includes memory having stored therein a predefined curve representing alternator output versus idle engine speed data.

[c11] 11. The outboard motor of claim 10 wherein the ECU is further configured to determine idle speed from the predefined curve based on the instantaneous power requirements.

[c12] 12. The outboard motor of claim 8 wherein the ECU is further configured to determine idle speed to prevent voltage of the battery from falling below a predetermined level.

[c13] 13. The outboard motor of claim 8 wherein the ECU is further configured to determine an idle speed for warm-up conditions of the engine that is independent of the instantaneous power requirements.

[c14]   14. The outboard motor of claim 8 wherein the ECU is further configured to instruct the idle speed control to set the idle speed of the engine to a level minimally sufficient to run the engine and satisfy the instantaneous power requirements.

[c15]   15. The outboard motor of claim 8 wherein the internal combustion engine has at least one fuel injector in direct communication with a cylinder of the internal combustion engine.

[c16]   16. A computer readable storage medium having stored thereon a computer program to adaptively regulate engine idle speed, the computer program having a set of instructions that when executed by a processor cause the processor to:
determine an instantaneous battery voltage level of a battery configured to supply power to an engine;
determine instantaneous power requirements of the engine; and
based on the instantaneous battery voltage level and the instantaneous power requirements, determine an engine idle speed.

[c17]   17. The computer readable storage medium of claim 15 wherein the set of instructions further causes the pro-

cessor to determine the engine idle speed from a map of predefined values stored in a memory accessible by the computer.

[c18]   18. The computer readable storage medium of claim 15 wherein the set of instructions further causes the processor to set engine idle speed to a level sufficient to drive a battery charging device such that the instantaneous battery voltage remains above a predetermined level.

[c19]   19. The computer readable storage medium of claim 15 wherein the set of instructions further causes the processor to set idle speed to a speed lower than that needed when the battery is not fully charged and the instantaneous power requirements of the engine is below a predetermined level.

[c20]   20. The computer readable storage medium of claim 18 wherein the set of instructions further causes the processor to set the idle speed to below 500 RPM.

[c21]   21. The computer readable storage medium of claim 15 incorporated in an ECU of an outboard motor having a direct injected engine.